satellite and terrestrial facilities to operate on the same frequencies.[33] The Commission has allowed cellular licensees to use signal repeaters as a cost effective means of correcting coverage problems.[34] In the SDARS proceeding, the Commission has permitted satellite licensees to use in-band, ground-based repeaters to fill gaps in their satellite coverage.[35] Thus, terrestrial use of L-band spectrum to augment MSS coverage is consistent with Commission precedent and its stated policy goals to encourage efficiency and technical, operational, and service flexibility.

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in order to provide licensees with the flexibility to determine the amount of spectrum they will occupy and the geographic area they will serve).

33 *See, e.g.,* Communications Satellite Corp., 8 FCC 2d 1001 (1967) (permitting satellite and terrestrial systems to share spectrum in the C-band); Redesignation of the 17.7-19.7 GHz Frequency Band, *Report and Order*, 15 FCC Rcd 13430 (June 22, 2000) (adopting a band plan designating how terrestrial fixed services, the Geostationary Satellite Orbit Fixed Satellite Service ("GSO/FSS"), the Non-Geostationary Satellite Orbit Fixed-Satellite Service ("NGSO/FSS"), and Mobile-Satellite Service feeder links ("MSS/FL") can share the 18 GHz band); Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency With GSO and Terrestrial Systems in the Ku-Band Frequency Band; Amendment of the Commission's Rules to Authorize Subsidiary Terrestrial Use of the 12.2-12.7 GHz Band by Direct Broadcast Licensees and Their Affiliates; and Applications of Broadwave USA, PDC Broadband Corporation, and Satellite Receivers, Ltd., to Provide A Fixed Service in the 12.2-12.7 GHz Band, 16 FCC Rcd 4096, *First Report and Order and Further Notice of Proposed Rulemaking* (Dec. 8, 2000) (concluding that a new terrestrial fixed Multichannel Video Distribution and Data Service ("MVDDS") can operate in the 12.2-12.7 GHz band on a non-harmful interference basis with incumbent Broadcast Satellite Services (BSS), and on a co-primary basis with the non-geostationary satellite orbit (NGSO) Fixed Satellite Service (FSS)).

34 *See* Amendment of Sections of Part 22 of the Commission's Rules Airborne Use of Cellular Telephones and the Use of Cell Enhancers in the Domestic Public Cellular Radio Service, *Report and Order*, 7 FCC Rcd 23 (1991). In reaching its decision, the Commission concluded that cellular repeaters would enable cellular licensees to fill in areas of poor coverage associated with an existing cell site and would provide a more economical way to increase coverage in new locations. *Id.* ¶ 15.

35 *See* Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band, *Report and Order, Memorandum Opinion and Order, and Further Notice of Proposed Rulemaking*, 12 FCC Rcd 5754 (1997).

Ancillary terrestrial use of L-band MSS spectrum is also consistent with Section 303(y) of the Communications Act. 47 U.S.C. § 303(y). Section 303(y) applies when the Commission seeks to allocate a frequency band for flexible use. As the Commission has recognized, Section 303(y) reflects Congress's concern that proposals for flexible use of spectrum have the potential, if not thoroughly considered, to create interference between services and discourage innovation.[36] As discussed below, the Commission does not need to reallocate the L-band in any manner in order to allow for terrestrial operations; rather, merely adding a footnote to the Table of Allocations will suffice. In any event, even if Section 303(y) did apply, its requirements would be met in this case. First, 303(y) requires the Commission to provide notice and seek comment, which the Commission clearly has done in this case. 47 U.S.C. § 303(y)(2). Second, allowing ancillary terrestrial use of L-band MSS spectrum is in the public interest because it will promote continued satellite service to all Americans and increase spectrum use and efficiency in the L-band. 47 U.S.C. § 303(y)(2)(A). Third, allowing terrestrial use of L-band spectrum is "consistent with international agreements" because MSV's integrated terrestrial operations will be on a non-interference basis as permitted by the *Radio Regulations* of the ITU. 47 U.S.C. § 303(y)(1). Fourth, ancillary terrestrial operations will spur, not deter, investment in communications service and technology because they will add value to MSS L-band spectrum by putting it to use in areas where it is unusable by the satellites and improve urban coverage. 47 U.S.C. § 303(y)(2)(B). Finally, ancillary terrestrial operations in the L-band will not result in harmful interference to other users. 47 U.S.C. § 303(y)((2)(C).[37]

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[36] Service Rules for the 746-764 and 776-794 MHz Bands, *First Report and Order*, 15 FCC Rcd 476, ¶10 (Jan. 7, 2000).

[37] *See* Motient, MSV, and TMI, Consolidated Opposition to Petitions to Deny and Reply to Comments, File No. SAT-ASG-20010302-00017 et al. (May 7, 2001); *Ex Parte* Letter

Footnote continued on next page

D. Viable MSS Systems Will Provide An Important Competitive Spur to Terrestrial Mobile Providers, Particularly in Rural and Remote Areas

The *Sixth CMRS Report* contains data demonstrating the uneven extent of competition among terrestrial wireless carriers. As the chart below indicates, 98% of the population in the counties making up the first quartile have at least three terrestrial wireless service providers from which to choose. In contrast, only 23% of the population in the counties comprising the last quartile have as much choice.[38] Despite the award of spectrum licenses in these areas years ago, these consumers have at most only one or two service providers from which to choose.

County Quartiles with Estimated Rollout by at Least 3 Mobile Telephone Providers[39]

County Quartile Based on Population	Total Number of Counties	Number of Counties with at least 3 Providers	Percent of Counties with at least 3 Providers	POPs in Those Counties	Percent of Quartile POPs with at least 3 Providers
1st Quartile	805	750	93.2%	229,657,015	97.9%
2nd Quartile	805	530	65.8%	21,118,979	67.2%
3rd Quartile	805	387	48.1%	7,099,963	50.2%
4th Quartile	804	145	18.0%	1,132,791	22.6%
Total	3219	1815	56.4%	259,008,748	90.8%

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from Bruce D. Jacobs, Counsel for Motient and MSV, to Ms. Magalie Roman Salas, Secretary, FCC, File No. SAT-ASG-20010302-00017 et al. (July 6, 2001); *Ex Parte* Letter from Bruce D. Jacobs, Counsel for Motient and MSV, to Ms. Magalie Roman Salas, Secretary, FCC, File No. SAT-ASG-20010302-00017 et al. (July 25, 2001).

38 The fact that the percentage of counties is only 18% suggests that, even within this quartile, there is less competition in less populous counties.

39 *Sixth CMRS Report*, Tables 4 and 5 at page C-5.

MSV, with its ubiquitous service offering, will provide another source of competition to terrestrial wireless carriers in *every* quartile, serving as a competitive spur to terrestrial wireless carriers much like Direct Broadcast Satellite service has done to provide such a spur for cable television operators.

II. REASONABLE RULES WILL ENSURE THAT TERRESTRIAL SERVICE IS TRULY ANCILLARY

A. Terrestrial Operations Should Remain Ancillary to Satellite Service

MSV supports the Commission's proposal to ensure that MSS providers continue their primary mission of providing satellite service, particularly to rural and remote areas. MSV will not operate a terrestrial-only system; rather, terrestrial operations will only supplement the satellite service in urban and indoor environments with terrestrial extensions. Moreover, no matter how much traffic is originated or terminated over the terrestrial base stations, the vast majority of the United States land mass will be served by the satellite and service in rural and remote areas will not be degraded as a result of the ancillary terrestrial use.

MSV supports the Commission's proposed definition of "ancillary," which indicates that terrestrial service will merely "supplement" or "augment" the satellite service, and will not differ materially from the principal service offered by the satellite. Thus, the high speed data and voice service provided over MSV's GSO satellite will not differ materially from the high speed data and voice provided via MSV's terrestrial base stations.

B. Terrestrial Base Stations Should Be Permitted to Operate Commercially Only After a Satellite Is Launched

MSV agrees with the Commission's proposal to adopt a rule that ensures that MSS licensees launch a satellite that provides certain coverage of the United States prior to operating terrestrial base stations for commercial service. NPRM, para. 42. Specifically, the Commission proposes a rule that would specify that an MSS operator in the L-band cannot use terrestrial

facilities unless (i) equipment is operating in the same spectrum segment as the satellite system; and (ii) the MSS operator can provide MSS in the areas its satellites are capable of covering.

As stated in its application, MSV plans to construct two satellites, and to launch the first satellite, MSV-1, to 101° W.L.[40] First-generation traffic will be transitioned to MSV-1 as operational needs dictate. The first-generation satellites will become in-orbit spares after their traffic is transferred. MSV-2 will be launched at a later date and will be positioned at 106.5° W.L.

MSV is currently exploring the use of satellite antennas larger than 12 meters in diameter. Such antennas will create high-gain spot beams, increasing the available link margin and the ability of the satellite signal to penetrate inside structures (thus decreasing the number of base stations required). With these larger antennas, however, MSV might not be able to cover Hawaii from 101° W.L. For this reason, MSV believes that the minimum coverage requirement prior to operating L-band MSS terrestrial facilities should be full-CONUS coverage rather than fifty-state coverage.

C. MSS Operators Should Be Required to Maintain Satellite Coverage and Service Availability After Beginning Terrestrial Operations

MSV supports a requirement that MSS licensees maintain their satellite service in order to provide terrestrial service. At the same time, however, if a satellite fails, the MSS operator should be given a reasonable period of time to launch a replacement satellite.

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40 Application of Motient Services Inc. and Mobile Satellite Ventures Subsidiary LLC, File No. SAT-ASG-20010302-00017 et al. (March 2, 2001).

As stated in its application, MSV plans to construct and launch two satellites.[41] L-band satellites of the type proposed by MSV take longer to build than more conventional C- and Ku-band satellites. At least 36 months are needed from contract start until the satellite is delivered to the launch site. Launch preparation, launch, and in-orbit testing raise the time needed to replace the satellite. Because the time required to build an L-band satellite is so long, MSV expects to maintain some kind of spare ready for assembly. By procuring "long-lead" parts for the spare, the time required to replace a satellite would be one to two years. Therefore, MSV recommends that the Commission adopt a maximum two-year limit during which the MSS operator would be allowed to operate terrestrial facilities without satellite coverage, in the event that satellite coverage is lost or limited due to a satellite failure.[42]

D. MSS Operators Should Be Required to Use a Central Data Switch to Insure That Terrestrial Service Remains Ancillary to Satellite Service

In the NPRM, the Commission asks for suggestions on how it can monitor the buildout of an integrated satellite and terrestrial system to ensure that terrestrial operations remain ancillary. NPRM, para. 45. One suggestion made by the Commission is that MSS operators integrate the terrestrial and satellite operations of their network through one central data switch to ensure that the terrestrial component remains ancillary. NPRM, para. 45. MSV supports this requirement to the extent that the Commission means by a central data switch that the satellite and terrestrial networks will be monitored and controlled centrally. As discussed in the attached Technical

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41 Therefore, assuming both initial launches are successful, MSV can meet the CONUS coverage requirement should one satellite fail. That is, a double failure is the only way MSV will lose coverage.

42 The rules should permit a waiver of the time limit under unusual circumstances, such as a launch failure of the spare or the complete unavailability of launch services.

Appendix, the distributed network of switches to be deployed in the MSV system will be monitored and managed from a central point of control.[43]

III. REASONABLE TECHNICAL RULES WILL PREVENT HARMFUL INTERFERENCE TO OTHER LICENSED OPERATORS

A. L-band MSS Operators Should Be Allowed to Operate Ancillary Terrestrial Facilities Only on Those Frequencies They Have Coordinated

The Commission asks what frequencies an MSS provider should be permitted to use for ancillary terrestrial operations. NPRM, para. 46. For L-band operators, terrestrial service should be allowed only on those frequencies to which the operator has coordinated access through the international frequency coordination process. The ability of L-band MSS providers to operate terrestrially should have no impact on international frequency coordination negotiations. MSV agrees with the Commission's proposal that any additional spectrum requirements generated by the terrestrial services should not be a factor for consideration in the annual coordination meetings.

B. Analogous Limits on Existing Services and Facilities Should be Applied to L-Band MSS Terrestrial Facilities

The out-of-band emission limit applicable to broadband PCS is appropriate for L-band terrestrial operations for protection of adjacent frequency bands. 47 C.F.R. § 24.238. Since these same limits are currently used successfully for terrestrial broadband PCS, equipment manufacturers have developed design techniques for a broad range of equipment that conforms to these limits. Thus, MSS operators will benefit from equipment manufacturers' experience with this rule. In addition, applying the out-of-band emission limit applicable to broadband PCS

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[43] Technical Appendix, Section IV.

to MSS terrestrial base stations will ensure regulatory parity between MSS and terrestrial wireless providers.

The existing out-of-band emissions limits in Section 25.213(b) of the Commission's rules should be applied to L-band base stations to protect GPS/RNSS. MSV will comply with this requirement by imposing the appropriate out-of-band filter characteristic on each deployed base station. Ericsson, one of the leading base station manufacturers, has provided technical evidence that MSV's base stations will be able to meet this out-of-band emissions specification into the GPS band.[44] Optimum radio resource allocation, dynamic management algorithms, and closed loop power control will also protect GPS. MSV's own mobile terminals will likely rely on GPS for deriving location information to comply with E911 requirements; thus, MSV has every incentive to ensure that its terrestrial base station operations do not interfere with GPS receivers.

C. Coordination Procedures for Protection of Co-Frequency Systems Should Be Adopted for L-band Terrestrial Systems

The existing broadband PCS rules regarding tower height, power limits, and coordination procedures provide an appropriate model for regulation of MSS terrestrial base stations. 47 C.F.R. § 24.232, 24.237. Thus, MSV supports the application of these rules to its terrestrial facilities.

D. Frequency Stability Requirements for L-band Terrestrial Operations Should Be Based on the Broadband PCS Rules

The frequency stability rules for MSS terrestrial equipment should parallel those of similar terrestrial communications systems. The Commission rules for broadband PCS systems require the fundamental emission to stay within the authorized frequency block. 47 C.F.R.

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[44] *See* Exhibit E.

§ 24.235. This simple requirement should suffice for MSV's ancillary terrestrial network equipment.

E. Restrictions Should be Maintained on Use of Handheld Terminals Aboard Aircraft

MSV agrees that the current restrictions on using handheld electronic devices onboard commercial aircraft should apply to the handheld terminals that will be used with MSS satellites and terrestrial facilities.

F. Requirements Should be Maintained for Priority and Preemptive Access for Aeronautical and Maritime Safety Services

As indicated in the attached Technical Appendix, MSV's integrated satellite and terrestrial system will be able to provide real-time priority and preemptive access in both upper and lower L-bands.[45]

IV. LICENSING REQUIREMENTS SHOULD FACILITATE RAPID DEPLOYMENT

A. The Commission Should Authorize MSS Operators to Integrate Ancillary Terrestrial Operations By Modifying Their Space Station Licenses

To allow MSS operators to operate ancillary facilities, the Commission should modify the operator's space station license to include blanket authority to construct and operate ancillary terrestrial base stations pursuant to the technical rules established in this proceeding. In MSV's case, the Commission should recognize that MSV has already applied to launch and operate a next-generation MSS system, which includes a request to operate ancillary terrestrial base

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[45] Technical Appendix, Section V.

stations.[46] Thus, MSV should not be required to file an additional application for a modified space station license for terrestrial operations.

It is not necessary to require additional information from MSS licensees or LOI grantees, such as a "radio frequency plan" for terrestrial operations. NPRM, para. 77. The technical rules established in this proceeding should be sufficient to address any interference problem. This blanket authority should allow an MSS operator to deploy base stations throughout the coverage of its MSS space segment. Such an approach will afford the MSS operator the flexibility to deploy terrestrial base stations in those markets it deems most important to its commercial viability.

Provided that the Commission establishes rules for the protection of adjacent band and co-channel users, there is no need for individual licensing and coordination of terrestrial facilities. Requiring individual licensing of these facilities will be burdensome and unnecessary. Individual applications and prior Commission approval should be required only if construction and operation of the facility would have a significant environmental effect.[47] This regulatory regime would be similar to the one the Commission has adopted for Wireless Communications Service ("WCS) base stations and has been proposed for DARS terrestrial repeaters.

Finally, MSV notes that international coordination of L-band ancillary terrestrial facilities with Canada should not present any difficulties. MSV's Canadian affiliate has already applied to Industry Canada to operate L-band terrestrial facilities in Canada.

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46 Application of Motient Services Inc. and Mobile Satellite Ventures Subsidiary LLC, File No. SAT-ASG-20010302-00017 et al. (March 2, 2001).

47 47 C.F.R. §§ 1.1301 –1.1319.

B. MSS Operators Should Be Permitted To Construct And Test Terrestrial Facilities At Their Own Risk

The Commission should allow construction and testing of terrestrial facilities (pursuant to an experimental license) at the MSS operator's own risk prior to meeting the satellite coverage requirements adopted in this proceeding and prior to obtaining an earth station license. As the Commission recognizes, such construction and testing will permit the terrestrial system to be in place when satellite coverage requirements are satisfied. Once an MSS operator's satellites are launched, it will be essential to initiate commercial service soon thereafter to begin receiving a return on that investment.

C. Mobile Earth Stations Should Be Blanket Licensed

As with current mobile earth terminals, an MSS operator should obtain a blanket mobile earth station license before offering terrestrial service. The blanket mobile earth station licensing process has proven adequate for authorization of the mobile terminals used for Motient's first-generation MSS system and there does not appear to be a reason to deviate from this process for the MSV's next-generation system.

Provided that MSS operators are required to obtain a prior earth station authorization for their mobile terminals, there is no need for a separate equipment authorization of MSS handsets designed to work with terrestrial facilities. This additional approval process will serve no apparent purpose.

In addition, terrestrial wireless mobiles are only required to go through an equipment approval process and not a separate licensing process. Thus, to ensure regulatory parity between MSS and terrestrial wireless providers, MSS mobile terminals should be required to have either an earth station license or an equipment authorization, but not both.

D. A Fee Should Not Be Imposed on L-band MSS Operators Incorporating Ancillary Terrestrial Operations

The Commission should not impose a fee on MSS providers who use their licensed spectrum for terrestrial operations similar to the fee imposed on broadcasters who use their DTV spectrum for ancillary data services. As the Commission recognizes, it would need statutory authority to impose such a fee. NPRM, para. 45. In any event, imposing such a fee on Motient and TMI would not be good policy, nor would it be consistent with the Commission's flexible treatment of other licensees that developed technical and operational innovations. Motient and TMI have already spent and lost over a billion dollars in developing their first-generation MSS systems and providing reliable service to rural and underserved areas to the benefit of consumers throughout the United States. Such innovation and willingness to spend the hundreds of millions of dollars required to launch and operate a next-generation satellite system to serve rural and underserved areas should not require an additional payment to the U.S. Treasury.

Neither Congress nor the Commission has imposed fees on other Commission licensees who have been granted the ability to innovate and expand their service offering. For example, MDS/ITFS licensees received authority to operate two-way systems and, most recently, mobile systems in addition to their originally contemplated one-way broadcast systems, but were not required to pay a fee for such technical and operational innovation.[48] The same can be said for the Commission's relaxation of its rules to permit cellular licensees to provide advanced data

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[48] Amendment of Parts 21 and 74 to Enable Multipoint Distribution Service and Instructional Television Fixed Service Licensees to Engage in Fixed Two-Way Transmissions, *Report and Order*, 13 FCC Rcd 19112 (1998) (allowing MDS/ITFS licensees to deploy two-way systems), recon., 14 FCC Rcd 12764 (1999), further recon., 15 FCC Rcd 14566 (2000).

services,[49] broadcasters providing data services on the vertical blanketing interval,[50] the inclusion of color for television licensees in the bandwidth originally established for black and white television transmission,[51] as well as a host of other technological innovations that provide the public with better and expanded services.

E. Adding a Footnote to the Table of Allocations is Sufficient for Permitting Ancillary Terrestrial Operations

Adding a footnote to the U.S. Table of Allocations (or simply amending current footnotes)[52] should be sufficient to authorize L-band ancillary terrestrial operations. Motient, ICO, and other MSS operators that are proposing to operate ancillary terrestrial base stations are not seeking to abandon MSS, so the L-band should remain allocated on a primary basis to MSS and not be reallocated to terrestrial use. Adding a footnote to the Table of Allocations will reflect that the terrestrial operations remain ancillary to MSS. In the SDARS proceeding, for example, the Commission added footnote US 327 to the U.S. Table of Allocations to permit DARS licensees to implement a terrestrial component to complement their satellite systems.[53]

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49 *See* Amendment of Parts 2 and 22 of the Commission's Rules to Permit Liberalization of Technology and Auxiliary Service Offerings in the Domestic Public Cellular Radio Telecommunications Service, Gen. Docket No. 87-390, *Report and Order*, 3 FCC Rcd 7033 (1988).

50 *See* Amendment of Parts 2, 73, and 76 of the Commission's Rules to Authorize the Offering of Data Transmission Services on the Vertical Blanking Interval by TV Stations, *Report and Order*, 57 RR 2d 832 (1985).

51 *See* Rules Governing Color Television Transmission, 18 FR 8649 (1953).

52 The Aeronautical Mobile Satellite (Route) Service allocation in the upper part of the L-band (1545-1559 MHz/1646.5-1660.5 MHz) permits the use of terrestrial base stations "when such transmissions are used to extend or supplement" to satellite-based transmissions. 47 CFR § 2.106 footnotes US309, 729, and 735.

53 In the Matter of Amendment of the Commission's Rules with Regard to the Establishment and Regulation of New Digital Audio Radio Services, *Report and Order*, 10 FCC Rcd 2310 (1995).

V. TERRESTRIAL OPERATIONS IN THE L-BAND MUST BE PROVIDED BY THE LICENSED MSS OPERATORS ONLY

MSV strongly opposes any proposal to make L-band MSS spectrum available for the provision of terrestrial service other than to an MSS licensee. Such an approach would cause debilitating interference to L-band MSS operators or severely reduce their satellite capacity, potentially breach international coordination agreements, jeopardize safety services, and slow the deployment of service.

Terrestrial operations in the L-band can occur without causing interference to existing MSS operators only if the satellite and terrestrial operations are integrated under the control of one entity. As discussed further in the attached Technical Appendix, time-sharing and dynamic spatial coordination are the only means by which ancillary terrestrial operators in the L-band can reuse frequencies assigned to the U.S. MSS system.[54] Time-sharing and dynamic spatial coordination require that ancillary terrestrial operations be an integral part of the MSS network.

Moreover, MSS providers need access to their entire currently licensed spectrum to improve their commercial viability and thereby to continue service to rural and underserved areas. International coordination of L-band frequencies has been difficult, because the aggregate demand of the different L-band systems far exceeds the current supply of spectrum. The shortage of L-band spectrum that currently hinders both Motient and TMI makes it essential that the Commission not allow any independent (non-MSS) entities to use even some L-band spectrum for terrestrial-only use.[55] Indeed, permitting independent use of the MSS spectrum by

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54 Technical Appendix, Section II.

55 The Commission has asked for comment as to whether the MSV and ICO proposals to use MSS spectrum for ancillary terrestrial use demonstrate that too much spectrum is allocated to MSS. NPRM at ¶ 28. Based on the many years of experience of Motient and TMI, MSV is convinced that there is ample demand for satellite-based mobile

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an entity other than the operator of an MSS system would be inconsistent with the L-band MSS coordination process, which addresses spectrum requirements of only the identified MSS operators. Because there are no international allocations for terrestrial use in the L-band, no independent terrestrial licensees would be allowed to engage in international coordination negotiations. Moreover, the details of these meetings are confidential among the parties, so any independent terrestrial licensee would not know the details of the current and future bilateral and multilateral coordination arrangements. Moreover, detailed knowledge of coordination arrangements is not sufficient to prevent independent terrestrial systems from interfering with MSS systems. At most, coordination details would enable protection of a portion of the foreign MSS system operations by confining terrestrial assignments to the spectrum assigned to the U.S. MSS system. However, this does nothing to prevent terrestrial systems from interfering with the U.S. MSS system and several foreign MSS systems that share frequencies with the U.S. MSS system. Prevention of such interference requires real-time knowledge of current and impending spectrum usage by the U.S. MSS system.

In addition, segmenting the L-band into terrestrial and satellite bands and then auctioning the terrestrial band would violate the International Table of Frequency Allocations which allocates the L-band on a primary basis to MSS and related aeronautical and maritime safety

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> services. However, current MSS operators have not been able to satisfy this demand, because potential customers are price-sensitive and require the capability of ubiquitous (rural and urban) communications. The proposals for ancillary terrestrial use simply demonstrate that MSS operators need the benefit of terrestrial operations to broaden the customer base thereby lowering costs to the end user, thus ensuring a more commercially viable system. A successful MSV will increase spectrum reuse for MSS through the use of more and smaller satellite spot beams and will use spectrum more efficiently as a result of the ancillary terrestrial network employing spectrum that would otherwise be unusable by the MSS satellite.

services. The United States is obligated by treaty to assign spectrum in a manner that is either consistent with this international allocation or does not cause harmful interference to other users.

A key aspect of the Commission's MSS L-band policy is its requirement that the licensee provide priority and preemptive access for aeronautical safety services in the upper L-band, and for maritime safety services in the lower L-band. 47 C.F.R. Section 2.106 footnotes US308, US315. Having independent terrestrial operators in the L-band would complicate, if not prevent, the ability of the MSS licensee to promptly preempt non-safety traffic in times of emergency and when necessary for accommodation of safety communications. Only if satellite and terrestrial operations are under the control of a common entity can preemption take place effectively. As discussed in the attached Technical Appendix, MSV's integrated satellite and terrestrial system will be able to provide priority and preemptive access.[56] In times of emergency, safety communications should not be compromised because of the inability to coordinate preemption between independent terrestrial and satellite operators.

Finally, the Commission is correct in its tentative conclusion that, if authority to provide terrestrial service in the L-band is limited to MSS operators, terrestrial rights would be linked to pre-existing MSS authorizations and, therefore, there would be no competing applications to trigger mutual exclusivity. NPRM, para. 39. Thus, there would be no need to reach the Commission's question as to whether the ORBIT Act's auction exemption for satellite spectrum applies to L-band spectrum used for ancillary terrestrial services.

The Commission asks whether allowing L-band MSS operators to use their spectrum for ancillary terrestrial operations would be consistent with 309(j)(3) of the Communications Act, which provides the Commission with guidelines to consider in establishing a competitive bidding

system.[57] As discussed above, if the Commission limits L-band terrestrial operations to MSS operators, there would be no mutual exclusivity presented and therefore no reason for the Commission to address 309(j)(3). Nevertheless, many of the goals of 309(j)(3) would still be met by allowing only L-band MSS operators to operate terrestrial base stations to supplement MSS. For example, terrestrial use of L-band spectrum by MSS providers will (i) allow for rapid deployment of new technology, particularly for rural areas,[58] and (ii) ensure efficient and intensive use of spectrum by allowing for use of L-band spectrum in urban areas where that spectrum is otherwise unusable.[59]

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56 Technical Appendix, Section V.

57 Section 309(j)(3) provides that, in identifying classes of licenses and permits to be issued by competitive bidding, the Commission shall seek to promote the purposes specified in section 151 of the Communications Act as well as the following objectives: (A) the development and rapid deployment of new technologies and services for the benefit of the public, including those residing in rural areas, without administrative or judicial delays; (B) promoting economic opportunity and competition and ensuring that new and innovative technologies are readily accessible to the American people by avoiding excessive concentration of licenses and by disseminating licenses among a wide variety of applicants; (C) recovery for the public of a portion of the value of the public spectrum resource made available for commercial use and avoidance of unjust enrichment through the methods employed to award uses of that resource; (D) efficient and intensive use of spectrum; and (E) ensure that, in the scheduling of any competitive bidding, an adequate period is allowed to permit notice and comment on proposed auction procedures and to ensure that interested parties have a sufficient time to develop business plans, assess market conditions, and evaluate the availability of equipment for the relevant services. 47 U.S.C. § 309(j)(3).

58 47 U.S.C. § 309(j)(3)(A).

59 47 U.S.C. § 309(j)(3)(D).

Conclusion

For the aforementioned reasons, Motient, TMI, and MSV urge the Commission to grant L-band MSS providers the flexibility to operate terrestrial base stations to augment their satellite service in urban and indoor environments.

Respectfully submitted,

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TECHNICAL APPENDIX

I. Signal Blockage

MSS is severely constrained by signal blockage in urban areas and indoors such that terrestrial operations are needed to service these locations. Studies have concluded that an average of 22.4 dB of attenuation of MSS signals is expected for outdoor use of an MSS mobile in urban areas.[1] To compound the problem further, an additional 3 to 4 dB of attenuation is expected due to body shielding.[2] While these attenuation levels exceed the practicable fade margins for MSS uplinks and downlinks, ancillary terrestrial operations can provide effective coverage for areas that experience this level of attenuation.

In addition to the average attenuation of approximately 26 dB for outdoor use in urban environments, using a mobile phone inside of a building or a vehicle increases the average attenuation even more. In estimating a terrestrial base station's coverage area, one leading manufacturer of mobile terminals and infrastructure generally applies an average building penetration margin of 18 dB for dense urban areas, 12 dB for suburban areas, and 6 dB for in-vehicle coverage.[3]

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1 *See Ex Parte* Presentation of Motient Services Inc. and Mobile Satellite Ventures Subsidiary LLC; File No. SAT-ASG-20010302-00017 et al. (July 6, 2001), Table 1; *see also* G.C. Hess, "Land-Mobile Satellite Excess Path Loss Measurements," IEEE Transactions on Vehicular Tech., Volume VT-29, No. 2, pp. 290-297 (May 1980); J. Goldhirsh and W. J. Vogel, Handbook of Propagation Effects for Vehicular and Personal Mobile Satellite Systems, Johns Hopkins University, Applied Physics Laboratory publication A2A-98-U-0-021, (December 1998).

2 *See* IEEE Transactions on Antennas and Propagation, "Effects on Portable Antennas of the Presence of a Person," Vol. 41, No. 6, June 1993.

3 E-mail from Mark Brattstrom, Product Manager, ERICSSON, to Peter D. Karabinis, MSV (Sept. 7, 2001); *see also* E. Walker, "Penetration of Radio Signals into Buildings in the Cellular Radio Environment," B.S.T.J., Vol. 62, No. 9, 1983; A.M.D. Turkmani, "Radio Propagation into Buildings at 1.8 GHz," COST231 TD(90) 117 Rev 1, 1991, and " Building Penetration Losses," COST231 TD(90) 116 Rev 1, 1991, and "Urban

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Some customers may choose to solve in-building coverage problems in rural and suburban areas with the use of Bluetooth or similar repeaters. For example, MSV plans to develop satellite transceiver terminals with built-in Bluetooth connectivity. Such a satellite transceiver terminal would be positioned inside of a building, close enough to a window or outside wall to ensure satellite link connectivity. The satellite transceiver unit would then transfer the satellite link connectivity, via a Bluetooth short-range link, to other Bluetooth-equipped devices inside the building. MSV's mobile voice/data terminals will also be equipped with Bluetooth connectivity. Thus, a user will be capable of in-building satellite-based services via very low cost, lightweight, and easy to use equipment.[4] This solution does not solve the problem of blockage in urban areas and is an impractical solution to implement nationwide, but it will be a valuable technique in individual cases.

II. Terrestrial and Satellite Operations in the L-band Must Be Integrated Under the Control of a Common Entity

A. L-band Terrestrial Operations Must Be Under Common Control

The Commission asks whether terrestrial and satellite operations must be under common control. MSV believes common control is necessary because:

Footnote continued from previous page

Transition Loss Models for Mobile Radio in the 900- and 1800-MHz Bands," COST231 TD(90) 119 Rev 2, 1991; I. Kostanic, C. Hall, J. McCarthy, "Measurements of the Vehicle Penetration Characteristics at 800 MHz," Conference Proceedings, VTC 1998.

[4] "Low-cost" means a price to the end user that is in-line with other commercially available, mass-market mobile telecommunications products. "Lightweight" means a device with comparable weight to a terrestrial wireless mobile phone. "Easy to use" means a consumer can simply set the device on a south-facing window-sill and the mobile equipment (either a mobile phone, lap-top PC, or PDA) equipped with Bluetooth connectivity inside the building becomes functional.

- Interference can be prevented only by continuously managing radio resources in real-time; and
- Technology is available by which a common control facility can effectively accomplish this task.

In order for terrestrial base stations to operate without causing interference to L-band satellite systems, a dynamic radio resource manager must be employed that allocates frequencies and distributes them (over both the space segment and the ancillary terrestrial facilities) as to prevent interference and satisfy user demand.

At times when a certain frequency is not used in a given MSS satellite beam coverage area or in the adjacent beams, that frequency may be used in the given area by a compatible terrestrial system. To avoid interference, the terrestrial system must vacate that frequency in the given area in advance of its next use in the same area by the MSS system. Because MSS frequency usage in any given area changes continuously, dynamic sharing of the spectrum across space and time is the only means by which ancillary terrestrial operators in the L-band can reuse frequencies assigned to the U.S. MSS system.

Space-time sharing requires that ancillary terrestrial operations be an integral part of the MSS network, as proposed by MSV. Continuously changing constraints on terrestrial frequency assignments must be met in order to avoid co-channel interference to uplinks and downlinks in the U.S. MSS systems. Additional dynamic terrestrial assignment constraints stem from the need to protect co-channel foreign MSS systems from the aggregate of terrestrial and U.S. MSS system emissions. The technology exists to provide this fully integrated satellite and terrestrial service using the same MSS frequencies. The development of this dynamic radio resource manager will be based largely on software principles currently in use by cellular and PCS systems for managing resources in hierarchical mobile cellular environments. A wealth of

dynamic radio resource management algorithms has already been developed by the cellular/PCS manufacturing community for hierarchical cellular and PCS systems.[5] These algorithms will be applicable and transferable and will serve as the basis for the development of the MSV system's dynamic radio resource manager.

B. L-band Terrestrial Operations That Are Fully Integrated with MSS Are Possible Even in Suburban Areas Without Interference to MSS Operators

Operation of L-band terrestrial base stations in some suburban areas may be needed in order to provide in-building penetration in those areas. In suburban areas, where the average shielding between a user terminal and the geostationary arc averages 16.9 dB, assuming outdoor use and before taking into account the additional 3 to 4 dB of body shielding, terrestrial transmission may be required to satisfy a high standard of quality of service. As stated above, intra-system interference (between terrestrial and satellite operations of the same operator) can be avoided if the integrated satellite and terrestrial network is under the control of a single entity. Even in sparse suburban areas, where the average outdoor shielding may be substantially lower than 16.9 dB, more limited but potentially worthwhile terrestrial reuse of satellite spectrum

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[5] Hierarchical terrestrial cellular/PCS systems involve a plurality of nested cells. A relatively large (macro) cell is often engineered to span a relatively large geographical area. (This is how a sparsely populated area may be covered). As the population density increases, other smaller (micro) cells within the macro cell are deployed to relieve capacity hot spots. These micro cells are given resources (frequencies) that are typically taken from the resource pool belonging to the macro cell. Having transferred some macro cell resources to the micro cells, the overall capacity of the geographical area spanned by the macro cell increases, since the micro cell frequency re-use is dense. However, because there will be times when more or less resources will be needed by the micro cells and visa versa, a dynamic radio resource manager is needed to continuously manage the allocations. The above process of nesting can be continued to additional levels, such as "pico" cells. For MSV's proposed system, the macro cells correspond to the satellite spotbeams and the microcells correspond to the ancillary terrestrial cells.

without causing inter- or intra-system interference can be accomplished through dynamic allocation of frequencies and the principle of space-time sharing.

Consider, for example, a mobile in a suburban outdoor environment using a satellite carrier. While the mobile is still active, it may migrate towards portions of the suburban area where it encounters more blockage or enters a building or vehicle. With common control of space and terrestrial resources, the system can re-assign the resource that the mobile is using to the appropriate terrestrial base station. The mobile call remains uninterrupted and continues to be served by the same resource (the same carrier). The only thing that has changed is that now the mobile user is being served terrestrially in order to provide in-building penetration or to overcome blockage. The key to the above interference-free resource allocation process is having the flexibility to control both space and terrestrial operations, thus being able to assign and reassign in real time resources where they are needed in order to maintain a quality of service consistent with end-user expectations.

III. MSV Will Monitor Aggregate Signal Levels from Ancillary Terrestrial Operations to Ensure that Interference Will Not Result to MSV's Satellites or Other L-band Satellite Systems

MSV's satellite system will have the ability to monitor the aggregate signal level generated by mobile terminals communicating with MSV's ancillary terrestrial facilities. Careful monitoring of the level of intra-system signal levels and limiting terrestrial frequency reuse accordingly will ensure that MSV's satellite service remains high quality.

This monitoring function will be an integral part of MSV's satellite system. As signal levels increase, effective link margin decreases and thus quality of service deteriorates (*e.g.*, the error rate increases, throughput in packet data modes decreases, and, in general, the dropped call

rate increases). Thus, in order to ensure the reliability of its satellite system, MSV will know and be able to control the signal levels resulting from its ancillary terrestrial operations.

MSV's own satellite system will be the most affected by signals generated by MSV's ancillary terrestrial operations. This is because the level of beam-to-beam isolation that MSV could rely on for suppression of signals from terrestrial reuse is not expected to be more than 10 dB. Other satellite systems using co-channel carriers but offering service to distant geographical areas (*e.g.*, South America) can rely on 20 to 30 dB satellite antenna isolation relative to CONUS.

In addition to suppression of signals due to satellite antenna isolation, signals will also be suppressed as a result of blockage. The level of blockage that the aggregate signals will experience, as a result of natural and man-made structures, will be statistically the same for geostationary orbital slots having substantially equal average elevation angles relative to CONUS (given a large population of randomly distributed mobile terminals within the ancillary terrestrial network). However, the aggregate signal level generated by ancillary terrestrial operations over CONUS will decrease as the average elevation angle between a satellite and CONUS decreases. While the precise effect is difficult to quantify, the additional margin is afforded to the lower elevation systems. Hence, by monitoring the aggregate signal level at the MSV satellites, it is possible to deduce and upper bound the aggregate signal level that other (non-MSV) satellites are experiencing, having also taken into account the antenna isolation characteristics of such satellites.

The ability of MSV's satellite system to monitor the aggregate signal level that is being generated by ancillary terrestrial operations will not only be used for MSV's own system, but will also be used to guarantee that the interference allowance set forth by the ITU will not be

exceeded relative to other satellite systems utilizing co-frequency spectrum over distant geographical areas.

IV. The Satellite and Terrestrial Operations of the MSV System Will Be Managed from a Central Point of Control

The timely development, deployment, and effective operation of a satellite system integrated with an ancillary terrestrial network demands a distributed switching architecture. All existing terrestrial mobile systems, whether national or regional in coverage, are based on distributed switching architectures. Switch elements are typically provided on a city-by-city basis. In MSV's case, the satellite component of the system will be operated from a dedicated switch, with a back up switch and ground station (gateway) located in a physically separate location. The ancillary terrestrial components of MSV's network will include many switches, or Mobile Subscriber Centers ("MSCs"), optimally distributed (based on economic and technical considerations) throughout the United States.

In order to function in a coordinated manner, the entire ensemble of disparate switches throughout MSV's network (over both the satellite and ancillary terrestrial component) will need to be networked together. The networking will include inter-switch trunks that will be used for intra-network information transfer, call setup and handover between different components of the system, frequency management, and real-time coordination for satisfying dynamic prioritization and preemption requirements. This entire distributed network of switches to be deployed in the MSV system will be monitored and managed from a central point of control.

V. L-band Operations Will Comply with the Commission's Priority and Preemptive Access Rules

A key aspect of the Commission's MSS L-band policy is its requirement that the licensee provide priority and preemptive access for aeronautical safety services in the upper L-band, and